

[FROM THE AUTHOR.

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A PHYSICIAN'S NOTES ON OPHTHALMOLOGY.

(2ND SERIES.)

BY

J. HUGHLINGS JACKSON, M.D. F.R.C.P.,

PHYSICIAN TO THE LONDON HOSPITAL, PHYSICIAN TO THE HOSPITAL FOR
THE EPILEPTIC AND PARALYSED.

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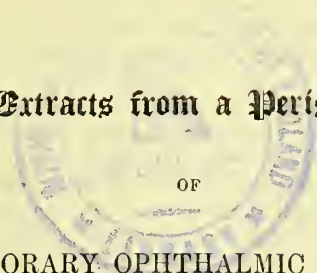




E. Burgess del et ch lith

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Recovery from Optic Neuritis.



Extracts from a Periscope

OF

CONTEMPORARY OPHTHALMIC LITERATURE.

ON RECOVERY FROM SEVERE DOUBLE OPTIC NEURITIS, IN A CASE
IN WHICH THERE WAS NO DEFECT OF SIGHT.

THIS case, and the chromolithographs by Burgess (see the Plate), have already appeared in Vol. IV of Crichton Browne's West Riding Asylum Reports. By Dr. Browne's permission the illustrations are reproduced. The upper one shows a disc during the acute stage of neuritis, the lower the same disc after recovery.

It is an exceedingly common thing to see neuritis, and neuritis as extreme as that here illustrated, with good vision. Hence, as Dr. Jackson has been urging for many years, the ophthalmoscope should be used by routine in cases of intracranial disease. Ophthalmic surgeons admit that optic neuritis may occur with very good sight; but Dr. Jackson wishes to urge that in physician's practice it does so occur *very often*. Indeed, there is in the cases of optic neuritis which come under his care rarely enough impairment of sight to prevent the patient reading the smallest type.*

But, so far as I know, he says, I have convinced very few persons of the truth of my assertion, that sight is often unaffected in optic neuritis. It seems mere nonsense to some to assert that when there is severe optic neuritis the patient can read *brilliant* type. Hence I continue to insist on the fact whenever a legitimate opportunity presents itself. I assert that we have frequently the *pathological condition*, optic neuritis, without the *symptom*, defect of sight. This is not a mere pathological curiosity. Those who ignore this fact naturally do not in cerebral cases

* What follows, to page 5, is almost a verbatim reprint from Dr. Crichton Browne's West Riding Asylum "Reports."

look at their patient's optic nerves until sight fails, *and thus they overlook the early and remediable stages of neuritis*. I believe that we should prevent amaurosis frequently if we always discovered the præ-amaurotic stage of optic neuritis and treated the affection energetically.

Those who wait until the patient's sight begins to fail, may err in taking as an early what is really a late stage of optic neuritis. So far as I know there is but one kind of optic neuritis from intracranial tumour (and other adventitious products). The ophthalmoscopic appearances vary extremely according to stage. Making conveniently, although arbitrarily, four stages, sight commonly fails in the third stage—a stage which is, I believe, by some called the “swollen disc.”*

The uppermost drawing shows that in speaking of optic neuritis with good sight one does not mean a mere slight change such as might be vaguely called “congestion.” The more one uses the ophthalmoscope the less confidently one speaks of “congestion,” and “anæmia.” Sight may be quite good when the disc is very much swollen (and so much altered that there is really no true disc discoverable), when the arteries are scarcely traceable in the swollen *ci-devant* disc, when the veins, which are dark and partly concealed, give clear evidence of swelling by knuckling over the edge of the diseased patch: there may be scattered blotches of blood.

Those who do not look at the optic discs unless there be failure of sight will not only overlook the earlier stages of optic neuritis, they may overlook it altogether. For sight may not fail. I have seen not a few cases in which sight did not fail.†

* I may here refer to a lecture on “Optic Neuritis from Intracranial Disease” which I published in the “Medical Times and Gazette,” August 26, 1871. The following extract from that lecture refers to stages:—

“4. *The Stages of Optic Neuritis*.—I now tell you what you see in cases of optic neuritis at different stages. In the sense that there are abrupt differences, there are no stages; there are gradual changes from the beginning of the process through its ascent to a climax of acute change, and in its descent to the permanent change—atrophy. Nevertheless, although the changes are gradual, the appearances are strikingly different at different times, and most unlike at the two extremes—the height of acute change and permanent atrophy. We will make four stages. You will have gathered from what I have just said that this division into four is arbitrary. I used to make two stages only. It is, I think, convenient to make four, for learners, at all events. The following is an account of what is seen at different stages of a severe case. I use the expression ‘severe’ advisedly, as cases vary so much in degree and progress that I do not pretend to be able to describe ‘typical’ cases. Particularly observe that cases do not always run through these stages. There may be retrocession from either the first or the second stage, and *not* a progress to atrophy. I speak of what you may see by the indirect method of examination.”

† I have recorded a case showing this strikingly in the “Medical Times and Gazette,” Dec. 7, 1872. A *résumé* of the chief points of it is given in the “Roy. Lond. Ophth. Hosp. Rep.,” vol. vii, part iv, Feb., 1873, p. 518, in section 4, “Recovery from Optic Neuritis.”

In the case I have to relate it did not. A common termination of optic neuritis is atrophy—what I call its fourth stage—but occasionally the swelling of stage 1 or 2 clears up, and, as in the case here illustrated, the disc resumes a normal or nearly a normal appearance. In this case the optic neuritis would never have been inferred; there was nothing whatever in the man's complaints or bearing to lead to a suspicion that his optic discs were abnormal. On the contrary, it would be said by most people that there "could not be" anything the matter with them. Had I not used the ophthalmoscope by routine the case would have been little more than one of paralysis of the third nerve. I should have ignored the *far more important symptom* (or, correctly speaking, pathological condition) optic neuritis.

I purposely give the case briefly, for without an autopsy it is of little value except as showing—

(1). *That sight may be good when there is extreme neuritis, and*

(2). *That the neuritis may disappear, the disc resuming what is practically a normal appearance.*

The patient did not recover from amaurosis; he never had any amaurosis to recover from. He took very large doses of iodide of potassium. My opinion is that this treatment prevented amaurosis, but as I always give large doses of iodide of potassium in such cases I cannot show more than a *post hoc*. Whenever I see optic neuritis I always give large doses of iodide of potassium.

A remarkably robust and healthy-looking Swedish seaman, 40 years of age, was admitted into the London Hospital on June 20, 1873. He had had a chancre many years ago, but apparently no secondary symptoms. He had had pains in the right side of his head for nine weeks, and after admission he had a little deafness of the right ear. One day, ten days before admission, he had some vomiting.

There was complete paralysis of the right third nerve which came on the day before admission. There was double optic neuritis. With the left eye he could read the smallest type, and denied that there was anything the matter with that eye; on the right side there was of course the defect of sight producible by palsy of accommodation. The first drawing of the left disc was made by Burgess on June 30. The patient could then as always read No. $1\frac{1}{2}$ Snellen.

He went out apparently quite well on August 19. The palsy of the third nerve had disappeared rapidly under the administration of iodide of potassium; the neuritis had not disappeared. He went to sea.

He came to show himself on October 23. He looked quite well and felt well. The morbid changes in his discs were insignificant. Those on the left side are represented in the second drawing, which was taken by Burgess, October 23. Seen for

the first time, a good ophthalmoscopist would hesitate to say that there had ever been any important acute change in that disc.

Such a case leads one to study carefully minute changes in the discs (as seen by direct examination), in order to make a retrospective diagnosis of optic neuritis.*

It is probable that the case I have related was one of intracranial syphilis. But as there was no autopsy it is not worth while commenting on this aspect of the case. I have reported several cases of optic neuritis from syphilitic disease of the brain, as proved *post-mortem*. ("Medical Times and Gazette," 1872-73-74.) I have recorded a marked case in the July number (1874) of the "Journal of Mental Science." I will now only say that *optic neuritis from syphilitic disease of the brain is not syphilitic optic neuritis*. Optic neuritis does not occur in such cases because syphilitic disease affects the optic nerves directly. There is a syphilitic tumour in the brain, and this causes optic neuritis, not in its character as a *syphilitic lump*, but in its character as a "foreign body." Any sort of mass in either the cerebrum or the cerebellum will cause optic neuritis.

I showed the original of the chromolithograph No. 1 at the meeting of the British Medical Association in August, 1873. The following is cut from the museum catalogue. I extract it to show that I then believed that the neuritis would disappear leaving sight good.

"Ophthalmoscopic drawing by Burgess. The patient, a man, could read the smallest type (No. 1½ Snellen) on the day (June 30, 1873) the drawing was made. His sight is still (July 21st) good. It is believed that the abnormal change will pass away, and that sight will remain good.—*Dr. Hughlings Jackson*."

In looking up this entry I come across the catalogue notes of cases by my colleague, Dr. W. R. Gowers. As Dr. Gowers' opinion on any point in medical ophthalmoscopy is most valuable, I try to strengthen the position I have taken up by his testimony. I italicise those parts which bear on the point I have been urging. The cases Dr. Gowers relates have numerous other important bearings.

The following is cut out of the catalogue. (Drawings 176, 177, 178).

"*Dr. Gowers on Optic Neuritis.*

"1. Optic Neuritis, *with preservation of acuity of vision*. Left optic disc of a woman, æt. 35, suffering from headache, epileptiform convulsions, and paralysis of the right arm, due probably to syphilitic disease of brain. The position of the optic disc is

* On this matter I have written in the "Medical Times and Gazette," Nov. 10, 1872; a reproduction of those remarks will be found in the "Roy. Lond. Ophth. Hosp. Rep.," vol. vii, part iv, Feb., 1873, in section 5, p. 520, "Slight Changes in the Optic Discs in cases of Cerebral Disease."

occupied by a greyish-red swelling, the redness being punctiform in the centre, striated on the peripheral portion. Vessels of nearly normal calibre, tortuous, and partly concealed on the swelling. The eye could read No. 1 Jäger. Field of vision of normal extent; blind spot of about three times the normal size. Both discs similar. *The neuritis cleared completely under anti-syphilitic treatment, leaving no atrophy.*

"2. Slight optic neuritis, from a girl, æt. 15, suffering from epileptiform convulsions. Outlines of disc lost under a reddish swelling of moderate prominence, and of about twice the normal diameter of the disc. Redness punctiform in the centre. Vessels of normal size. Connective tissue about the vessels in the centre of the disc unduly conspicuous. *Could read the smallest test-type.*

"3. Early stage of neuritis. Left optic disc of a girl, æt. 25, suffering from right-sided convulsions, right hemiplegia and aphasia, due to a gliomatous tumour of the left hemisphere. A reddish swelling occupied the position of the disc, and concealed its outlines; the outer part was paler than the centre, and striated. Veins distended; arteries of normal size, partly concealed by the swelling. *The eye could read No. 1 Jäger. Both discs were similar.*"

Here Dr. Gowers gives the further course of the case. The girl became blind.

EYE-SYMPTOMS IN PATIENTS THE SUBJECTS OF CONGENITAL SYPHILIS AND WITH DISEASE OF THE NERVOUS SYSTEM.

In the "Journal of Mental Science," January, 1875, Dr. Hughlings Jackson relates a case of dementia occurring in a lad who had choroiditis of one side. The boy died but no autopsy was obtained. The mental condition need not be detailed; only so much is reproduced as bears on the value of the ophthalmoscope in diagnosis.

The following notes of the case were taken in the summer of 1872:—

"Samuel L., æt. 15, is the subject of congenital syphilis. The evidence supplied by his own person is (1) that he has that malformation of the upper central incisor teeth which has been described by Mr. Hutchinson as characteristic of congenital syphilis. The lad's upper central incisors are small, and narrowed at their cutting edges; they are not notched. (2) There are in the left eye remains of choroiditis; there are numerous pigmented patches. The left optic disc is atrophic (greyish). The cornea is clear."

Dr. Hughlings Jackson makes the following remarks on the one-sided choroiditis:—

"The striking thing was that in the right eye there was nothing abnormal, although the left was much diseased. Both

Mr. Hutchinson and Mr. Waren Tay agree in this. Obviously this non-symmetry in a disease so very 'constitutional' as syphilis is of marked interest to students of disease of the nervous system. The choroid is the pia mater of the eye.

"At first glance the one-sidedness of the morbid condition appears to go against the diagnosis of congenital syphilis. Mr. Hutchinson, however, considers it to be the rule for choroiditis in connection with tertiary syphilis to be unsymmetrical, and this remark applies alike to that resulting from inherited and to that from acquired disease. It is not, however, he tells me, usual to find, as in this boy's case, that one eye is *quite* free from changes. He has, however, seen a few similar cases. The common condition is for one eye to be severely affected and the other only slightly. And he thinks that in some cases of choroido-retinitis in connection with hereditary syphilis, in which the changes simulate those of retinitis pigmentosa, the non-symmetry is a valuable point in diagnosis. Mr. Swanzy, of Dublin, has published an interesting example of this in the 'Dublin Quarterly Journal,' May, 1871. Mr. Swanzy there quotes a letter from Mr. Hutchinson."

The following are further facts in this case warranting the diagnosis of congenital syphilis and thus confirming the diagnosis of the syphilitic nature of the choroidal disease.

"*Family History*.—Two years before his marriage the father had a skin disease, and had a bad sore throat. He is dead; hence the vague history. Moreover, he died insane in Colney Hatch. The boy's mother, six or seven months after marriage, lost 'all her hair' (no doubt an exaggerated expression); soon after marriage she suffered from a severe sore throat, which lasted seven or eight months; her tongue was very sore; she had a skin disease 'like small boils or pimples.'

"The mother had seven children born alive. The following gives the results of all her pregnancies:—(1) Still-born. (2) Died at age of one month. (3) Samuel L., the subject of this report. (4) A child who now suffers from a skin disease. (5) Miscarriage. (6) Died at the age of five months; suffered from 'snuffles,' and had a skin disease. (7) A miscarriage. (8) A child who has a skin disease. (9) Died at the age of six-and-a-half months: 'used to break out in the head,' and suffered from snuffles. Nearly all the children, including our patient, suffered from a rash on the buttocks when infants.

"It is important to note that our patient is the eldest living. This boy has not had keratitis. He may yet have it. There is in my mind no doubt that this lad was the subject of congenital syphilis. The dental malformation, to say nothing of the choroiditis and of the family history, is, I think, decisive. A good many years ago I had the inestimable advantage of working with Mr. Hutchinson, and as a result of seeing many cases with

him I was convinced that he was right in his assertion as to the diagnostic value of the malformation of the teeth he describes. So far as it goes, the family history supports the diagnosis founded on the dental malformation and the choroiditis.

"Of course it is not said that congenital syphilis does not exist without either the dental malformation or the interstitial keratitis. On the contrary, it has been stated that these signs usually exist only in the eldest living of a syphilitic offspring. The younger children, no doubt, suffer in slighter degrees.

"We are justified in concluding that this boy's right choroid had at one time suffered from syphilis, and thus the *hypothesis* was, for the sake of treatment, warrantable that his pia mater, the 'brain's choroid,' had suffered similarly,—had been the seat of a 'pia matritis,' analogous to the choroiditis. My speculation is that there was local syphilitic disease, followed by general atrophy of the hemispheres. It is well known that extensive *local* damage (clot, softening, or tumour) in a hemisphere leads slowly to general wasting of that hemisphere."

In the July No. (1875) of the "Journal of Mental Science," Dr. Hughlings Jackson, in dealing with Syphilitic affections of the Nervous System, mentions several facts of ophthalmological interest. The first of the following extracts is partly to the same effect as the note of Dr. Hughlings Jackson's remarks in our last Periscope, p. 89.

SYPHILITIC AMAUROSIS.

"*Sight*.—Amaurosis occurring with other symptoms attributable to syphilitic disease of the brain may be put down, as a matter of course, to syphilitic changes in the deep tissues of the eyes, choroido-retinitis, by those who do not use the ophthalmoscope. This is a very grave error. It is true that amaurosis, in such cases, *may be* due to syphilitic changes localised in the *fundus oculi*, but as a mere matter of fact, it scarcely ever is. It is nearly always owing to optic neuritis or to atrophy, the sequel of that neuritis. Now, 'optic neuritis from syphilis' is not 'syphilitic optic neuritis.' The optic neuritis produced by a syphilitic tumour is just like that produced by a glioma, or by any other adventitious product in the cerebrum or cerebellum.

"I know of no evidence to prove that optic neuritis is produced either by syphilitic disease actually involving the optic nerve trunks inside the cranium or by syphilitic meningitis at the base.* I speak of post-mortem evidence; clinical evidence is not sufficient.

"I never saw a neuroma of the optic nerve. I do not remember seeing simple atrophy of the optic nerve (atrophy not the sequel of neuritis) in a patient who had other nervous symp-

* "I know nothing of syphilitic meningitis. Need I say that I except cases of meningitis from *bone* disease, the result of syphilis."

toms inferentially due to syphilis, to say nothing of never seeing post-mortem evidence of intracranial syphilis in such a case. The other kind of optic atrophy* is often seen.

"Here it is important to remark that amaurosis from syphilitic choroido-retinitis is really a syphilitic disease of the nervous system, quite as much so as a syphilitic neuroma is. There is syphilitic disease of connective tissue of a nervous organ, the nervous elements suffering secondarily. He who speaks of amaurosis from optic neuritis due to syphilitic gumma in the cerebrum, and amaurosis owing to syphilitic choroido-retinitis, as if they were alike, calling them 'Syphilitic Amaurosis,' without qualification, is not speaking scientifically. It would be like speaking of a whale and a salmon as being zoologically alike."

The following is from the same paper:—

"PARALYSIS OF OCULAR MOTOR NERVES AND VERTIGO.

"PARALYSIS of an ocular motor nerve is a cause of vertigo. Now, the vertigo may be the symptom which the patient has first of all; that is, he has vertigo before there is actual double vision, or obvious strabismus. It would be a great blunder to say of such a case in a patient the subject of syphilis, 'In this case the vertigo was the first symptom of the syphilitic disease of the brain, and then palsy of the sixth or third nerves occurred.' In reality the vertigo would, in all probability, be owing to paresis of an ocular muscle, before actual demonstrable palsy of it occurred. The vertigo continues, of course, when the palsy is established.

"Anyway it would be very misleading to call vertigo, so caused in a syphilitic patient, 'syphilitic vertigo,' for all syphilis does, in such a case, is to damage a nerve bundle, and vertigo would attend paralysis of an ocular motor nerve, however caused. It is an error easy to fall into. If the motor nerve affected be the fourth, the ocular palsy is not obvious, and may be overlooked. And when there is evident paralysis of the third nerve, the vertigo resulting from it may be erroneously put down as a symptom independent of that palsy, and due to implication of a nerve centre. But be it remarked that the expression 'syphilitic vertigo' is just as warrantable as is the expression 'syphilitic epilepsy.' The expression sounds more grotesque, simply because it is novel."

* "I may here remark that I only know of one kind of change in the optic nerves from intracranial tumour, syphilitic or other, and this I call optic neuritis. There are all degrees of this change, from a climax of great swelling with hæmorrhages to white atrophy. I do not recognize a swollen or choked disc, from raised intracranial pressure. There is a swelling of the disc in some cases of tubercular meningitis and pyæmia. The swelling is, I believe, from venous thrombosis; but I have had no demonstration of it."

ON OCULAR VERTIGO; ITS BEARING ON THE INTERPRETATION OF THE GAIT OF LOCOMOTOR ATAXY, AND THE REEL OF DISEASE OF THE CEREBELLUM.

DR. HUGHLINGS JACKSON thinks that from consideration of certain symptoms in cases of palsy of ocular muscles we obtain a clue to the interpretation of the real nature of disorders of co-ordination, such as the reel in disease of the cerebellum and locomotor ataxy. He finds that this has in effect been already stated by Wundt. In the "Medical Press and Circular," May 12, 1875, Dr. Jackson writes:—

"The term disorder of co-ordination is frequently used; but it is applied to diseases which are fundamentally different; for example, it is applied to chorea and to locomotor ataxy. Of course, both these *are* disorders of co-ordination; but the term is used without qualification, and this leads to the two different, indeed opposite, states being considered as alike in their physiological or functional causation. Chorea and locomotor ataxy are not only unlike in that different parts of the body are affected, but unlike in the functional affection. In the former there is 'over-function;' in the latter there is *loss* of function. In view of the active motor disorder of the ataxic patient, the statement that there is loss of function of the nervous centres for locomotion seems, at first glance, absurd. But is there not wasting of nerve fibres in the posterior column of the cord? And what could this 'cause?' It would 'cause' nothing active. It could not 'cause' the disorderly gait—in fact, it could 'cause' nothing. The disorder of co-ordination in locomotor ataxy and in some other affections is owing to a double difficulty consequent on *loss* of function of nerve tissue; there is really paralysis. There is (1) over-estimate of a movement intended to be executed by the centre diseased, but not accomplished, and (2) by healthy centres, increased action of associated movements in accordance with the over-estimate. The explanation given of the disorder of co-ordination in locomotor ataxy applies *mutatis mutandis* to the reel from disease of the cerebellum."

The following is a quotation from the *Mirror of the Lancet*, January 30, 1875:—

"At first glance it seems absurd to speak of there being loss of power in locomotor ataxy, at any rate in an early stage of this disease. The patient has great power in his legs. Dr. Hughlings Jackson believes that there is paresis, and this only of certain highly special *movements*. As a centre (the posterior column of the cord) is affected, there could not be *loss* of power in single muscles or groups of muscles, but loss or defect in *movements*, in which several muscles co-operate. Dr. Hughlings Jackson believes that the first *movement* to fail in cases of locomotor ataxy is that in which the peroneus longus is the *muscle*

chiefly concerned. In other words, there is weakening of that most important locomotor movement which serves in throwing the body over on to the other foot, pivoting on the ball of the great toe. But by this the *erratic* gait of ataxy is not explained. We can, however, show that from local palsy or paresis we get *secondary effects*; it is here that we get the explanation. To show this, we must take a simple case from another department of clinical medicine—from ophthalmology.

"In a case of paresis of the external rectus we find more than diplopia. The patient's giddiness and reeling gait are not due, as is commonly supposed, to double vision. There is, from an attempted but not accomplished movement of the eyeball, erroneous estimation of the *position* of objects. This is because, to use metaphorical language, the mind judges, not by the ocular movement accomplished, but by the effort to move the eyeball—judges, to use an expression of Bain's, by the 'out-going current.' We note next that the strong attempt to move the paralysed or weakened external rectus leads to over-movement of an associated muscle—viz., of the internal rectus of the healthy eye; there is 'secondary deviation' of that eye. Applying the principle to locomotor ataxy, we should say that there is a double difficulty to be considered in the patient's walk—erroneous estimate of the locomotor movement intended and over-action of associated movements.

"In an early stage of locomotor ataxy these ill-consequences can, whilst the eyes are open, be partly corrected by great voluntary effort, by stiffening the back and certain parts of the legs, by throwing out the arms, &c."

LATERAL DEVIATION OF THE EYES FROM DISEASE OF THE PONS VAROLII.

IN this Journal, Feb., 1873, there are reproduced facts and remarks from Dr. Hughlings Jackson's series of cases of intracranial tumour, from the "Medical Times and Gazette," 1872, and *seq.* The series is being continued, and contains many facts of interest to ophthalmic surgeons.

"One case (Case 9, 'Medical Times and Gazette,' January 3, 1874,) is both interesting and rare. As mentioned in the last Periscope, p. 93, lateral deviation of the eyes is not a very uncommon symptom in cases of brain disease, but this was a case unusual in three respects. The deviation was persistent; it was *from* the side of the lesion; it was owing to disease of the pons varolii. The case is worthy of reference by those interested in loss of ocular movements from disease of nervous centres. A careful examination of the diseased brain by Dr. Gower is given. The following remarks appear in the number following that containing the report of the case:—

"In disease of the corpus striatum (a grave lesion) there

occurs lateral deviation of the two eyes, but the eyes turn then towards the side of the lesion, not from it, as in Case 9. It is better, however, to say that in the lateral deviation from lesion of the corpus striatum the patient cannot turn the eyes to the side paralysed. In Case 9 the patient could not turn them to the side *not* paralysed, or rather to the one least paralysed. Moreover, in cases of disease of the corpus striatum the deviation is usually transitory, unless the lesion be *very extensive indeed*. In Case 9 it was persistent. This is the only case in which I have known lateral deviation of the eyes in a chronic case. This is the only case of disease of the pons varolii in which I have encountered lateral deviation of the eyes. I have, of course, several times seen palsies of the sixth nerve, or of both of them, in cases of disease of the pons; but lateral deviation, as are other conjugate deviations, is a symptom of a very different kind from paralysis of a nerve trunk—it is due to lesion of a centre where *complex* movements are represented. I need not pursue this subject here. For a knowledge of such deviations, Vulpian's 'Physiology of the Nervous System,' and Prevôst's monograph on 'Conjugate Deviations of the Head and Eyes' should be studied."

AUTOPSY IN A CASE OF HEMIOPIA WITH HEMIPLEGIA AND HEMIANÆSTHESIA.

A SHORT note on this subject was made in the last "Periscope," p. 101. The following is the case then alluded to in a footnote as having appeared in the "Lancet," August 29, 1874. The patient died subsequently to that report; the account of the autopsy is reproduced from the "Lancet," May 22, 1875:—

"It is now well known, thanks to Vulpian and Prevôst, and to Humphry, Lockhart Clarke, Broadbent, Russell Reynolds, and others, that from a *grave* lesion (a large and sudden lesion) of the higher divisions of the motor tract (corpus striatum and optic thalamus) there results hemiplegia, in which there is not only paralysis of the face, arm, and leg, but also deviation of the two eyes and frequently of the head. [See last 'Periscope,' p. 93, and p. 95.] The eyes, head, and face turn *from* the side paralysed, because muscles of these parts on the side paralysed can no longer balance those of the non-paralysed side. The patient has lost power to *look* towards the side paralysed.

"It is interesting to observe that hemiopia occurs in some cases of hemiplegia, and these cases seem to be the 'sensory analogues' of the above-mentioned cases in which the two eyes and the head are deviated. In the one (when the eyeballs are deviated) the patient is unable to *look* to the paralysed side; in the other, when there is hemiopia, he is unable to *see* to the paralysed side. The lateral deviation, with rare exceptions, is a

transitory symptom: the hemiopia Dr. Hughlings Jackson has discovered in a few chronic cases of hemiplegia; possibly it is sometimes transitory. Of course, cases in which the hemiopia has come on at the same time as the hemiplegia—cases of a single lesion—are alone spoken of. When the two symptoms are found after a *sudden* seizure, as in the case to be narrated, we may assume that they are owing to a single local lesion.

“Dr. Hughlings Jackson has had no* autopsy on any case of this kind. But since he thinks hemiopia in cases of hemiplegia may be overlooked, especially when the lateral fields of vision are not blind but only obscured, it is permissible to draw attention to the clinical association. We should examine the field of vision in all cases of hemiplegia when the patient's condition permits. These examinations will be of very limited value unless we at the same time note the *kind* of hemiplegia. In the few cases of which Dr. Hughlings Jackson has notes there has been considerable defect of sensation in the paralysed parts—face, arm, and leg. There has been hemianæsthesia as well as hemiplegia. It is true that in *many* cases of hemiplegia there is some defect of sensation *soon after the attack*, but it is rare to find great loss of sensation in a *chronic* case of hemiplegia; the cases of hemiplegia with hemiopia above spoken of were chronic. Another thing to be noted is, the relative degree of loss of power in which the several paralysed parts suffer. In hemiplegia, the rule is that the arm suffers more than the leg; but in some, at any rate, of the cases of hemiplegia with hemiopia, the leg suffers more than the arm—or, rather, suffers more in proportion than is common.

“Dr. Hughlings Jackson, having had no autopsy, refers to the tenth of Charcot's Lectures on Diseases of the Nervous System. From that lecture we take the following:—‘In short, we may conclude, I think, from what has been said, that there is, in the cerebral hemispheres, a complex region, lesion of which determines hemianæsthesia. We know approximatively the limits of this region; but, actually, the localisation cannot be pushed further, and no one has the right to say whether, in the region indicated, it is the optic thalamus which is implicated rather than the ‘capsule interne,’ the centrum ovale, or the third nucleus of the corpus striatum.’ In ‘Le Progrès Médical,’ Nov. 1st, 1873, is a valuable paper by Bourneville, entitled “De l'hémianesthésie liée à une lésion d'un hémisphère du cerveau.”

“Cases like the one to be now narrated have interest with regard to the elucidation of those remarkable cases of †migraine in which temporary hemiopia and temporary one-sided sensation disorder are symptoms.

* The autopsy was obtained subsequent to the publication of the life history of the case.

† See note on “Hemiopia and Coloured Vision,” &c., p. 331.

"*Anæsthesia of the right halves of the two retinæ and corresponding loss of sight in the left fields of vision; hemiplegia of the left side (of the side to which he sees imperfectly); very considerable defect of sensation of that side.*—Thomas R—, aged sixty-five, on November 24th, 1871, at 8 P.M., felt sick, and vomited in the backyard of his house. He then went up-stairs, but after three steps he had suddenly to stop, fell against the railing of the stairs, and next became unconscious. He felt as if (with the left foot) he were treading on sponge. He was 'unconscious' for two weeks, but whether deeply so all the time is uncertain. He talked in three weeks, but for six weeks he was too ill to be left night or day. We have evidence of a sudden seizure with loss of consciousness, evidence pointing to a 'grave' lesion somewhere. The probability is, that that grave lesion is clot, but it is possibly softening from thrombosis of the *trunk* or of a *large branch* of a cerebral artery*—a large branch, because the lesion must have been a very 'grave' one.

"There has been no albuminuria to support the diagnosis of clot. It is clear, at any rate, that there was a sudden and local lesion of the right side of the patient's brain, and probably the disease is in the hinder part of the optic thalamus. The hemiplegia was discovered when the patient came round from the insensibility, but during the first fortnight it was observed that his left leg and thigh were 'as cold as a stone.'

"March, 1873.—*Examination by* Dr. HUGHLINGS JACKSON.—Motor: There is now no paralysis of any part supplied by cranial (motor) nerves, except that there is a very trifling drawing of the face to the right. The eyeballs and the head move well, in extreme movement in all directions. He can execute all large movements of the upper limb (shoulder on trunk and downwards), but they are all imperfect, feeble, and slow. The leg is more paralysed than the arm; he can walk, however, a great distance.—Sensory: There is great diminution of sensation of the left side of the body, face, trunk, and limbs. This does not follow the distribution of any nerve in particular. The whole of the left half of the head has less feeling than the right, the anæsthesia not being limited to those regions supplied by the fifth nerve. It is to be observed that the defect of sensation does not come *quite up* to the middle line of the trunk; there is about half an inch to the left of the middle line in which the feeling, if not as good, is nearly as good as on the right. (Probably the sensory nerves of the two halves of the body interlace at the middle line. Herpes zoster occasionally

* "The posterior cerebral artery has, according to Duret ('Archives de Physiologie,' Janvier, 1874, p. 81), ten branches, of which one is, in Duret's nomenclature, 'Artère interne et postérieure de la couche optique,' and another 'artère moyenne des tubercles quadrijumeaux.' Duret's researches are of great value both for the pathology and physiology of the brain."

passes the middle line slightly.) When severely pinched with the nails on the trunk or arm he has only an unpleasant sensation, and when he is pinched on the hand he feels it up the arm; 'up the marrow of the bones' is his expression. He often drops things out of the left hand—*e.g.*, if he places his stick in it in order to open the garden-gate with the right hand, the stick often falls out. He is a tailor. One day when ironing he brought the 'nose' of the hot iron against his left hand, and yet had only an 'unpleasant sensation,' although he discovered later that the skin had been severely burnt; the skin was 'pushed up' he said. He accounted for this mishap by saying that he could *not see to the left*. The left leg feels to him cold, and he has, since his illness, slept with one 'leg' of a pair of drawers on it. I have at the hospital a series of balls of the same size and appearance, but varying in weight irregularly from one of which the inside is lead to one of covered cork. He readily arranged these balls with his non-paralysed arm, but though he can lift each with the partially paralysed arm, he does not, so he says, know any difference by weight betwixt them. Dr. Tibbits assisted me in investigating the condition of electric sensibility of muscle, but we could arrive at no trustworthy conclusion.

"He is a snuff-taker, but has ceased to take snuff up the *left* nostril as 'it is of no use,' he does not feel it on that side. Snuff, of course, is an irritant, and is appreciated by common sensation, but his snuff-taking is important, as possibly the habit may have blunted the sense of smell proper. It is only possible to say from my examinations that I think his sense of smell proper is diminished. There is, as stated, hemiopia, and this is on the left (*i.e.*, the left fields, the right halves of the two retinae being affected.) This defect of vision he found out when he came round from the insensibility. He occasionally sees only part of a word. He one day saw 'land,' the real word being 'Midland.' He remarked to his son that 'Liver' was a 'queer name,' but his son pointed out to him that it was 'Oliver.' These words were in capitals on carts in the street. I could not come to any conclusion as to taste; if affected on the left side it must be so only slightly. He is said to have been deaf of the right ear thirty-five years, and as to the left, it can only be said that his wife is sure that he does not hear so well as before the illness. He seems to me to hear well on both sides.

"1874.—His condition seems to be still practically the same. He has had what was probably a slight paralytic attack early this year, but no clear account of it was obtainable. It left no obvious permanent effects.

"The following from the 'Lancet,' May 22, completes the case:—

“ ‘In our ‘Mirror’ of August 29th, 1874, we reported a case of left (field) hemiopia with left hemiplegia, and hemianæsthesia. The patient has since died. He died after a few days’ illness, which, from his friends’ account, presented no further definite local symptoms of nervous origin. His brain was examined by Dr. Gowers, who found but one lesion. It was, as was stated in our ‘Mirror’ of August 29th to be probable, ‘in the hinder part of the thalamus opticus.’ Dr. Gowers, who did not know the history of the case, also made a diagnosis of hemiopia—a retrospective diagnosis from his examination of the brain. His report is as follows :—

“ ‘The right optic thalamus presented a considerable depression over its posterior half, where it was much softer than that of the opposite side. On section the tissue was seen to be softened, greyish-yellow in tint. The amount of softening was greatest on the inner side, the posterior tubercle (pulvinar) being broken down and destroyed, and here the softening extended up to the ventricular surface. It did not extend beyond the limits of the thalamus into the white substance of the hemisphere or the crus, and the anterior half of the thalamus and posterior extremity of the corpus striatum were intact. The microscopic characters were those of simple softening. The vessel at the base were moderately atheromatous; no occluded vessels near the softened area could be discovered. Convolutions healthy. No disease elsewhere.’ ”

GENERAL REMARKS ON CASES OF HEMIOPIA OCCURRING ALONG WITH
HEMIPLEGIA.

“HEMIOPIA is not, Dr. Hughlings Jackson thinks, so rare a nervous symptom as is commonly supposed. This and the following remarks only apply to cases seen in physician’s practice, and therefore to hemiopia associated with other nervous symptoms. It occurs most often with hemiplegia. Dr. Hughlings Jackson has seen eleven* cases of this kind. Significantly the association is such that the patient cannot see to his paralysed side. To this rule Dr. Hughlings Jackson has seen no exception. He has now two patients in the London Hospital who are hemiplegic on the left, and who have lost sight entirely in their left ‘fields.’ They have been carefully examined by Mr. Couper.

“The hemiopic patient in the street runs up against people; when going out of a room he strikes his hand against the door-post; he pushes glasses off the dinner-table. Hemiopia is more especially incapacitating when it is right-sided (field), as we read and write from left to right. It is discovered in some cases of partial aphasia, but is easily overlooked. In such cases the patient’s writing, or rather attempts at writing, are a series of lines begun from the left and ending on the right, after a few

* Also two others since this note appeared.

syllables or syllable-like scrawls. Hemioopia was discovered in one of the two hemiopic patients in the hospital because he read words of the test-types on the right side of the page only. At that time it was difficult to investigate his case on account of a mental defect which Dr. Hughlings Jackson calls 'Imperception.' It was very difficult to explain to him that he could read from the left side of the page by holding his book in a properly-adapted position.

"Such cases, Dr. Hughlings Jackson thinks, disprove the recent assertions as to the total decussation of the optic nerves in man."

HEMIOPIA AND COLOURED VISION PRECEDING ONE-SIDED EPILEPTIFORM SEIZURES.

TEMPORARY hemioopia and temporary one-sided development of colour are well-known symptoms of migraine. Temporary development of colours (usually red, see p. 27) is a common "warning" of an epileptic seizure as well as an initial symptom of migraine. In the following case the kinship of migraine to epilepsy seems to Dr. Hughlings Jackson to be illustrated. The report is from the "Lancet," August 14, 1875:—

"Dr. Hughlings Jackson believes that cases of migraine, and certainly those in which there are ocular phenomena with one-sided sensation disorder are (that is, according to his definition of the word epilepsy) epilepsies, for he thinks that the symptoms depend on a local excessive cerebral discharge. However, he thinks that whilst the ocular phenomena and the unilateral sensation disorder are parts of the paroxysm, the headache and vomiting are post-paroxysmal symptoms. Moreover, he believes it to be most likely that the "discharging lesion" in this epilepsy is of some parts of the cortex of the posterior lobe, that it is of convolutions, or of parts of them, which are developed out of the optic thalamus. The reason for so thinking is, that these 'sensory epilepsies' bear the same relation to hemianæsthesia with hemioopia from disease of the optic thalamus, as unilaterally beginning convulsions do to the ordinary kind of hemiplegia from destruction of the corpus striatum. Dr. Latham thinks that the paroxysm of migraine is owing to arterial contraction in the region of the posterior cerebral; Dr. Liveing, that there is in the paroxysm a 'nerve storm' traversing the optic thalamus and other centres. Dr. Hughlings Jackson's view as to localisation will be supposed to be a compromise betwixt these two opinions. It may here be pointed out that this localisation of the 'discharging lesion' in migraine accords with an old conclusion of Dr. Jackson, viz., that the anterior part of the cerebrum is the chiefly motor, and the posterior the chiefly sensory region. This speculation agrees with Ferrier's experiments. Dr. Jackson does not, however, suppose that the

separation of motor and sensory regions is abrupt. The case which follows is mixed sensory and motory. Discharging lesions may no doubt be developed in any part of the cortex cerebri from front to back.

"Whether the word epilepsy be used in the commonly accepted sense or in the novel sense, the case here reported shows the relationship of certain symptoms of migraine to epilepsy. The hemiopia is especially interesting.

"Colour development is not an uncommon precursory symptom in cases of epileptiform or epileptic seizures. It is common in migraine. In this girl's case, if her memory serves her, the colours began on the side which does not correspond to the side convulsed; one reason for thinking her account erroneous is that the transitory hemiopia was left-sided (field), as was the convulsion at its onset.

"M. B., æt. 16, consulted Dr. Hughlings Jackson in August, 1873, having had fits for six years. She walked at the age of 16 months, and talked very early. It is said that she had spasmodic croup at the age of 10 months. She was subject to attacks every winter until the age of 13. An attack would come on about ten o'clock at night, and last for two hours, when vomiting and relief came. What the real nature of this illness may have been is matter of doubt; the mother said the girl made a noise like croup, and imitated the noise of laryngismus stridulus very closely. At the age of three years it seems clear that she had a bad attack of jaundice; she was, her mother averred, delirious and insensible for two or three weeks. She had never had scarlet fever nor rheumatic fever; she had had measles, chicken-pox, and whooping-cough. No facts bearing on hereditary tendency to any kind of nervous affection were obtained.

"She seemed to be in good health. She had begun to menstruate at the age of twelve and a half years, and for the last twelve months the catamenia had been regular. There was no heart disease; there was no ear affection, nor had there been any. She had thread-worms.

"It is interesting to note that there was a clear account of gradual development of her seizures. She had at first attacks of coloured vision only for some months before anything further. There is circumstantial evidence of this. Her mother thought the child was bilious, and waited until her holidays began to give her physic. Further evidence that these mere attacks of coloured vision were really rudimentary or incipient fits was that later on she occasionally had these attacks, sometimes followed by convulsions, sometimes not. As she says, 'if the colours do not leave, the fit comes on.' After having several attacks of coloured vision only, she would have a severe fit. The colour began suddenly. There were red and green. The red comes first and the

green was underneath the red. The background was black and the colours moved fast. Her mother said the girl always *looked to the left* when the colour appeared. This is significant, because 'when the colours do not go away,' and when the full fit comes, the head turns to the *left*, the *left* hand shakes, the arm works; there is *left*-sided convulsion. Later there is convulsion of the right side, and she is unconscious; occasionally there is tongue-biting. But here is to be stated further evidence as to gradual development of the fits. For some years she did not lose consciousness; the strong presumption is that at that time the convulsion did not pass beyond the left side, the side first convulsed; moreover, in some seizures, when she was under Dr. Hughlings Jackson's care, she did not lose consciousness, even when the fit was so severe that the left arm was invaded.

"She is certain that the colour began in the *right* side of her field of vision, and spread to the left. Moreover, some years before—no accurate date could be given—she had transitory hemiopia before the fits, but never immediately before. She might, for example, see 'half a face' at breakfast-time, and have a fit in the evening, but then in the interval the 'colours would keep coming and going.' According to the mother, the child could see to the right when hemiopic—that is, the left was the blind field. On one occasion she, over a period of a few days, occasionally saw on the left side an object of about the shape and size of an octavo page, dotted all over with rounded dots closely set. This was, she said, 'instead of the colours.'"

COLOUR.

IN some chapters on Epilepsy ("Med. Press and Circ." 1874—75), Dr. Hughlings Jackson adverts to the double use of the word Sensation. It is used both for mental states and for the physical states of the nervous system which persist during those mental states. Thus it is used for colour and for the molecular changes which occur in the retina, optic nerve and higher centres when there is the mental state, colour. Similarly, a sudden development of coloured vision is sometimes erroneously compared with spasm of muscles, as if the two things were analogous. Speaking of sudden and paroxysmal development of the colour red as being equally as convulsive the result of a cerebral discharge (and in his nomenclature an epilepsy), Dr. Hughlings Jackson writes:—"The word 'red' is really a name for a mental state. The proper comparison is therefore not betwixt the sensation of redness (mental state) in an epileptic discharge and convulsion (physical state). This would be to compare two things which are utterly different. The comparison, physiologically, would be betwixt abnormal excitations of optic centres and nerves and abnormal excitations of motor centres and nerves. We cannot observe the results of excitation of

'sensory' nerves and centres. We have to rely on what the patient tells us, and, of course, he can only tell us of what occurs before he loses consciousness; we can observe the results of excitation of motor centres and nerves after he has lost consciousness."

The comparison is not betwixt colour and any kind of physiological condition of a motor nerve. Psychologically, the comparison is betwixt colour and shape, and physiologically betwixt excitations of sensory nerves and centres and excitations of motor nerves and centres.

Speaking more generally ("Med. Press and Circular," Dec. 2, 1874) on the distinction betwixt mental and physical states, Dr. Hughlings Jackson shows how the distinction is neglected in cases of vertigo, as well as in cases of coloured vision. As the illustration of vertigo given is ocular vertigo, the remarks may be fitly reproduced here.—"If we consider the facts of the vertigo attending palsy of the ocular motor nerves, we see plainly that it is a *motor* symptom. It is, however, sometimes spoken of as a sensory symptom, because a 'sensation' attends it. It is one of those disorders of co-ordination which has a subjective side. But the 'sensation' in this case is a state of mind, and states of mind may arise during energising of motor as well as of sensory nerves and centres. Our direct concern is with the physical process which goes on in the nervous system whilst the 'mental state,' which is a feeling of vertigo, continues; it is the physical process which is a disorder of motion—actual or nascent. There is as much difference betwixt the sensation or feeling the giddy man has and the physiological process which goes on in his nervous system, as there is betwixt pain and the changes in the sensory (afferent) nerve which exist whilst the pain lasts, or as there is betwixt the colour red and the changes in the optic nervous system associated with it."

Dr. Hughlings Jackson then quotes John Stuart Mill on the matter; colour and its physical substratum being the illustration Mill gives. This quotation should be carefully considered by those who write as if what begins as molecular vibration, or some physical change, in the retina and optic nerves, fines away into sensation of colour, *i.e.*, a physical into a mental state.

"Let it be shown, for instance, that the most complex series of physical causes and effects succeed one another in the eye and in the brain to produce a sensation of colour; rays falling on the eye, refracted, converging, crossing one another, making an inverted image on the retina, and after this a motion—let it be a vibration, or a rush of nervous fluid, or whatever else you are pleased to suppose, along the optic nerve—a propagation of this motion to the brain itself, and as many more different motions as you choose; still, at the end of these motions, there is something which is not motion, there is a feeling or sensation of colour.

Whatever number of motions we may be able to interpolate, and whether they be real or imaginary, we shall still find, at the end of the series, a motion antecedent, and a colour consequent."—(Mill's *Logic*, vol ii, p. 436.)

THE ANATOMICAL SUBSTRATA OF VISUAL IDEAS.

DR. HUGHLINGS JACKSON has long taught that the convolutions, like the inferior nervous centres, represent impressions and movements. In other words, he believes that the unit of composition of the nervous system from the lowest to the highest centres is a sensori-motor arrangement. He thinks it to be clearly so in the case of the substrata of visual ideas. He urges that, in actually seeing, there is concerned a retinal impression and an ocular movement; in thinking of (ideal seeing) an object there is concerned a nervous arrangement which represents these two elements, the motor as necessarily as the sensory.

There are three qualities in bodies: secondary or dynamical, primary or statical, and secundo-primary or statico-dynamical. The secondary or dynamical properties are estimated by sensory nerves and centres; the primary or statical are estimated by motor nerves and centres. Dr. Hughlings Jackson supposes the secundo-primary or statico-dynamical properties to be estimated by impressions and movements represented in the cerebellum; of these, nothing is said in this note (see p. 23).

The colour of an object is, on its physiological and anatomical side, simply an affair of the retina and other higher sensory centres therewith associated; on the other hand, its size and shape are estimated by ocular movements.* So far for acquiring visual ideas of objects for actually seeing them. But when we have seen an object we can see it again ideally, or, in synonymous terms, "think of it." Dr. Hughlings Jackson believes (in accordance with the opinions of Spencer and Bain) that the ideal seeing is a repetition of the actual seeing, with a difference corresponding to the difference that one is a faint mental state, the other a vivid mental state. In thinking of objects the central discharge is (1) sight, and (2) limited to the centre. In actually seeing them it is (1) strong, and (2) spreads from periphery to the centre and from centre to periphery.

In short, he believes that the anatomical substratum of the idea of an object consists of two elements, a sensory and a motor. Speaking of visual ideas, the substratum represents a particular retinal impression and also a particular ocular movement.

* It is understood, of course, that the estimation by the eye is symbolical. On the association of ocular movements with tactual movements, as evidenced by cases of hemiplegia with lateral deviation of the eyeballs, see last *Periscope*, p. 97. The association of hemiopia with hemi-anæsthesia is similarly significant (see last *Periscope*, p. 101, and note in this *Periscope* on Autopsy in a case of Hemiopia with Hemiplegia and Hemi-anæsthesia).

The following, from the "Medical Times and Gazette," May 29, 1875, refers to the same subject. As the opening sentences show, it is from a paper dealing generally with the representatives of movements in the cerebral convolutions:—

"To myself, who have for more than ten years been teaching that convolutions represent movements, it naturally comes easy to believe that the experiments of Hitzig and Ferrier are a demonstration that this is the anatomical constitution of certain of them. Those who have read the quotations above given, will not accuse me of affectation when I say that I was surprised that any one hesitated to accept the conclusions of the recent experiments. My own opinion is that the prevalent confusion of psychology with the anatomy and physiology of the nervous system is much to blame for the incredulity. 'Centres for ideas' are often spoken of, but nothing at all is said of the *anatomical* substrata of any class of ideas. I hold that the anatomical substrata of ideas are sensori-motor arrangements. It seems to me to be plain, almost to demonstration, that there *must* be a motor element in the substratum of a visual idea. How else could we possibly have ideas of the *shape* and *size* of an object? I beg the reader to take note that this is not an after-thought. I do not write this because Hitzig and Ferrier find that they develop movements of the eyes by electrical excitation of certain parts of the cerebral cortex. I believed that movements of the eyes must be represented in the cerebral hemispheres before their experiments were begun. Before it was surmised that movements could be produced by artificial excitation of the brains of healthy animals, I wrote as follows ('Medical Times and Gazette,' October 23, 1869) of the anatomical substrata of visual ideas:— 'In the organised forms which serve as the mental representatives of objects when the objects are absent, there will therefore be comprised not only impressions of surface, *but residua of movements*. . . . The speculation supposes that we have particular visual impressions in fixed association *with particular ocular movements*. A convulsion in which the eyes are strongly deviated is owing to an excessive discharge of a part where the motor elements of the substrata of visual ideas are largely represented."

ON THE MOST GENERAL MODE OF REPRESENTATION OF THE MOTOR AND SENSORY ELEMENTS OF VISUAL, ETC., IDEAS.

In the same series of paper, Dr. Hughlings Jackson puts forward a speculation as to the most general mode of representation of the motor and sensory elements which enter into the substrata of ideas—visual ideas being the illustration. He thinks (quoting from an abstract of one of his Gulstonian Lectures, "Brit. Med. Journal," March 6, 1869), that "*facts seem to show that the fore part of the brain serves in the motor aspect of mind, and we may fairly speculate that the posterior serves in the sensory.*"

This speculation seems to him to accord with one of Ferrier's conclusions from his experiments. The following is a quotation from a summary of Ferrier's researches, "Med. Record," March 18, 1874:—"The whole brain is considered as divided into a sensory and motor region, corresponding to their anatomical relation to the optic thalami and corpora striata and the motor and sensory tracts."

Thus, Dr. Hughlings Jackson thinks that, for the most part, the sensory and motor elements of the substrata of ideas *are represented apart*. The meaning of this separation, Dr. Hughlings Jackson suggests, is that the sensory and motor elements which enter into the physical side of what is, psychologically speaking, our perception of the statical and dynamical qualities of objects, can be, so to speak, transposed—can enter into new combinations. After seeing a red circle and a blue square, we can *think of* a red square and a blue circle. The separation is never absolute. It is impossible, for example, to think of redness only. In accordance he speaks of the *chiefly* motor and sensory regions. Yet we can think of red things of innumerable forms.

The principle is, he thinks, capable of extension in various degrees to all the higher mental operations—to all complex states betwixt the organism as acted on (chiefly sensation side), and the organism as reacting (chiefly motion side),* and accounts for what takes place, anatomically and physiologically, during the mental process, which, beginning as metaphor, ends in abstraction.

ON COLOURED VISION AND SPASM OF OCULAR MUSCLES IN EPILEPTIC OR EPILEPTIFORM SEIZURES.

It was stated in a former note, p. 20, that when we see an object (vivid mental state) there is both a sensory and a motor process, and that what is left when the object is removed, is also a permanent modification in both a sensory and motor element. When (faint mental state) we think of the object ("remember it," "become again conscious of it," "see it ideally," &c.) what occurs is a slight and central excitation or discharge of these two modified elements. Now, having re-stated this we can consider what occurs when there is an *excessive* discharge of centres containing crowds of these elements. It is to be noted that (see p. 21) the two elements are supposed to be represented widely apart. Hence from cerebral discharges we may have almost solely sensory phenomena (ocular spectra, and unilateral dysæsthesia, as in some cases of migraine. See note, p. 16) or we may have almost solely motor phenomena, as in lateral deviation of the eyeballs and convulsion of the face, arm, and leg.—(See note in last Periscope on Correlations of Movements of Eye and Hand, p. 95.)

* All modes of consciousness can be nothing else than incidents of the correspondence betwixt the organism and its environment.—Spencer.

We consider now what occurs when there is such a discharge of the substrata of visual ideas as occurs in an epileptic fit. The following extract (Med. Press and Circular, Nov. 4, 1874) gives Dr. Hughlings Jackson's views on the subject. After considering what occurs during the discharges when we have vivid visual ideas (see things actually) and also what occurs during the discharges when we have faint mental states (see things ideally) he writes:—

"Now for the epileptic discharge. *It must never be forgotten that it is an excessive discharge.* Not only is it very much more excessive than the discharges which occur when we have faint mental states, but it is very much more excessive than those occurring in vivid mental states. Besides being excessive, it is of a limited part of the brain. It is rapid, and it is soon over. In such excessive discharges as the epileptic discharge of our supposed centres for visual ideas there could not be a development of ideas of objects neither of such ideas as occur in health nor of such as occur in delirium and insanity. We have, however, to do with what occurs physically. We have to do with epileptic discharges of those *sensori-motor processes* which are the *anatomical side of ideation*. There is in some cases of epilepsy evidence of excessive excitation of parts of the brain representing retinal impressions, as the patient has clouds of colour before his eyes. There often occurs also, as part of a larger fit, that clotted mass of movements of the ocular muscles which we call spasm (for example, strong lateral deviation of the eyes). In the first case there is, I believe, a sudden and excessive discharge of a limited part of the cerebral hemisphere, which contains crowds of the sensory element, and in the second, of a limited part of the cerebral hemisphere which contains crowds of the motor element, in the highest processes of the series for visual ideas. The discharge in the epilepsy being very strong, rapidly spreads down to the lower centres, and by these to the muscles, and thus produces innumerable ocular movements at once, or rather jams innumerable ocular movements into one stiff struggle.

By the severe discharges which *begin* in the substrata of *visual* ideas the substrata of other ideas are *reached*; but it is convenient to limit the illustration.

REPRESENTATION OF OCULAR MOVEMENTS IN THE CEREBELLUM.

As stated in the Periscope of last No. (foot note pp. 94 and 95), Dr. Hughlings Jackson believes that certain of the ocular movements—those for the estimation of distance are represented in the cerebellum. This to some extent accords with certain of Ferrier's conclusions. The following is part of a preface to a reprint of Dr. Hughlings Jackson's paper on "Localization of Movements in the Brain."—(Reprinted from the "Lancet," 1873.)

"I believe that all the muscles of the body are represented

in the cerebellum, as all are in the cerebrum but in different order. I spoke chiefly of the representation in the cerebellum of movements of the eyes, and at the same time for the sake of contrast of the representation of ocular movements in the cerebrum. I quoted Adamük and Donders to show that the parallel* movements of the eyes which Hering and Donders think are for direction, are represented in parts of the corpora quadrigemina different from those parts of these nervous centres, where movements of adduction and abduction of the eyes, which they suppose to be for estimating distance, are represented. I suggested that the former, which I consider to be the movements for estimation of Extension, are *re-represented* in the cerebrum. It has, indeed, long been well known that lateral movements of the eyes are represented in the cerebrum (Vulpian, Prevôst, &c.). I suggested also that the movements for distance,† and I would now add for depth and resistance, are *re-represented* in the cerebellum (see Section 17).‡ These two orders of movements occur together in health, but disease separates them. Thus there is loss of the lateral movements of the eyeballs in some cases of disease of the cerebrum; from extensive disease of one side of the cerebrum, we have loss of *one half* of the lateral movements of the two eyes. In order to understand loss of one half of the ocular movements for estimation of distance by disease of one side of the cerebellum, we must note that there is something more than mere convergence. The movement of the eyeballs in estimating distances is a complex one. Besides alteration in the size of the pupil, and difference in tension of the ciliary muscle, there is convergence and divergence of the visual lines.§ It must be particularly noted that in convergence the eyes are directed slightly downwards, and in divergence upwards. Now it is an old-established fact that, as is stated in Section 17, in lesions of the right middle peduncle of the cerebellum there is a skew deviation of the eyes. The right eye is turned upwards and inwards, the left downwards and inwards. This seems to

* Unfortunately I said "side to side" movements, instead of "parallel."

† Ferrier's experiments seem to me to show that this speculation is correct.

‡ These ocular movements are supposed to be *symbolic* of distance, depth, and resistance, statico-dynamical properties, estimated by locomotor movements. I use the word locomotor in an unusually wide sense. When I put out my hand to feel the surface of a book, my putting forth the hand is, I consider, an act of locomotion, and it is, I think, a cerebellar movement. The movements of my finger ends over the book (tactual) are cerebral movements, and serve in the physiological process of giving me notions of superficial size and shape. The former go with an act of convergence of the eyeballs, the latter go with the concomitant sweeping movements of them.

§ It seems to me that Loring's experiments demonstrate that the external recti are *in action* in looking into the distance. Indeed, it would be a very exceptional thing if there were not *action* of both external and internal recti, both in divergence and convergence. There is, as Duchenne points out, a co-ordination of antagonism, as well as a co-ordination of co-operation.

me to be loss of *one-half* of the movement for the estimation of distance. Only one-half, for there is a one-sided lesion only. It will, I think, be seen that the speculation as to the representation of these ocular movements is verified by some of the results of Ferrier's experiments on the cerebellum. And the further speculation that these ocular movements are represented by nervous arrangements in the cerebellum associated with movements of locomotion, goes also with Mr. Spencer's hypothesis that the cerebellum is the organ for doubly compound co-ordination in space."

THE EYE AND EAR IN THE ESTIMATION OF SPACE AND TIME.

In the Hospital Reports of the "Medical Times and Gazette," August 7, 1875, are some remarks by Dr. Hughlings Jackson, on the movements associated with hearing. In a former note (p. 325), it was pointed out that movements of the eyes are essential in the estimation of Extension (size and shape). In the following extract movements associated with the auditory nerve are spoken of as being essential in the estimation of Intervals. It is given here as it bears indirectly on the matter discussed in the note on the Anatomical Substrata of Visual Ideas. (See p. 335.)

The auditory nerve is in two divisions; one, the cochlear, Dr. Hughlings Jackson thinks (having regard to Lockhart Clarke's researches) is afferent to centres in the medulla oblongata for movements of the heart, and the other (the tripartite division for the semi-circular canals) is afferent to centres for locomotion in the cerebellum.

"So far we have spoken separately of the two divisions of the auditory nerve as if one were an auditory and the other a sensory-locomotor nerve. We now consider their possible relations to one another. If it be, as above suggested, that the cochlear and the canal divisions of the auditory nerves are afferent respectively to the heart and to the movements of the head and neck (and thus indirectly to locomotor movements), we see that the compound nerve which is called 'auditory' has, saying nothing of the tensor tympani and stapedius muscles, much muscularity in dependence on it. Yet it differs notably from the eye, for the movements of the eyes are comparatively independent of those of the rest of the body—require translation into them,—while the movements which we are supposing to be associated with the ear are those constantly serving the organism as a whole. That is to say, the movements of the head and neck, are the first and most important of locomotor movements; the heart is the most central of all organs. It is exceedingly important to note the double association of movement. For the fact of association of the ear and circulation bears on the anatomico-physiological process which goes on whilst we acquire ideas of Time. The ear is not merely for the estimation of sounds, but of Intervals;

just as the eye is not merely for the estimation of colours, but of Extension. That the ear has to do with time as the eye has to do with space, is, of course, a truism; but we wish to point out the importance of rhythmical *movements* in the estimation of time by the ear. Let us first consider the analogous case of the eye and space. We could have no notion of extension by mere impressions on the retina; there must be movements of the eyeballs. (See note p. 26). *To suppose that we know the shape of an object by the merely sensory process of an object, as it were, imprinting itself on the retina, is to suppose that the positions of the several retinal elements in relation to one another is known already.* These can only be learned by movements. Similarly, to say that, since the ear receives sounds in succession, this kind of reception gives one an idea of their time-relation, assumes that particular intervals are already known. Dr. Hughlings Jackson believes that intervals are learned by movements of the heart; that our ideas of time have final, although unconscious, reference to the rhythm of the heart, as our ideas of space have to movements of our locomotor organs.

"If this hypothesis be true, its bearing on the process for the estimation of distance is important and obvious. The auditory is a nerve which is partly afferent to a rhythmical, time-dividing organ, and partly afferent to leading locomotor movements of the whole body. To those *born blind*, Platner says, time serves instead of space; those who can see, as it were, sum up by the eye large space travelled over by *successive* movements of the whole body. Those born blind estimate distance by the time it takes to pass from place to place; and the time will, the hypothesis is, be measured by the duration, number, and intervals of locomotor movement, estimated by movements of the heart, associated with the division of the auditory nerve for the semi-circular canals.

"The above speculation seems to Dr. Hughlings Jackson to harmonise with what Spencer has written as to the estimation of time by organic rhythms. The following quotation may be read in connection with the foregoing; it is from the first volume of 'Spencer's Psychology,' page 217:—'A stationary creature without eyes, receiving distinct sensations from external objects only by contacts which happen at long and irregular intervals, cannot have in its consciousness any compound relations of sequence, *save those arising from the slow rhythm of its functions.* Even in ourselves the respiratory intervals, joined sometimes with the intervals between the heart's pulses, furnish part of the materials from which our consciousness of duration is derived; and had we no continuous perception of external changes, and consequently no ideas of them, these rhythmical organic actions would obviously yield important data for our consciousness of time—indeed, in the absence of locomotive rhythms, our sole data.'"

COLOURED VISION IN AMAUROSIS AND EPILEPSY.

THE following may be read in common with previous remarks on Coloured Vision, in our last Periscope, page 91. It is from the Hospital Reports of the "Lancet," January 16, 1875.

"Patients who are blind or partly blind from atrophy of the optic nerves are not always in darkness; they may be in redness. The following is a note by Dr. Hughlings Jackson of a case he saw in private:—"Some years ago I saw a patient with defect, not loss, of sight, from simple atrophy of the optic nerves, who said his sight sometimes became 'blood-red,' and would be so all day. He was tormented by this, and spoke of it as being 'frightful,' 'terrible.' He had not always the coloured vision. One day he remarked to me: 'To-morrow is not a red day—it is a dull, dark day.' So that it would seem there was some kind of order in the intermissions. It is worth notice that his coloured field was broken by black lines and dots. Most unfortunately I had no note of the patient's power of *seeing* colours, which might, perhaps, have been roughly tested in the intervals of his coloured sight. The probability is that the patient would at no time during his defect of sight have been able to see red. The attacks of red sight were analogous to attacks of spasm. Now, it is certain that spasm attacks, as it were, *by preference* those parts which are most subject to paralysis, and will attack parts already partially or even completely paralysed. Thus we should by analogy expect that the colour first lost and the one first developed would be the same."

It is understood, of course, that the comparison spoken of is, strictly speaking, betwixt excitations of sensory and motor nerves and centres; the comparison of development of *colour* with *spasm of muscles* is nonsensical, for colour is a state of mind. [See note on Colour, p. 18.]

"When colour development is a warning of an epileptic seizure, the colour developed is, Dr. Hughlings Jackson thinks, generally red. It is not always so."

This was remarked on in the last Periscope, p. 91. Dr. Hughlings Jackson says he finds that Falret has long since noticed that a premonitory symptom or beginning of an epileptic seizure is often red vision, but then Falret says too, "or purple," which colour is a mixture of the extreme colours red and blue (see next note).

WARNING (AURA) OF COLOURED VISION IN RELATION TO EPILEPTIC
"DREAMS," AND TO EPILEPTIC MANIA.

THE following is from the same number of the "Lancet," but contains additional sentences:—

"In chronic conditions of mental impairment it seems certain that 'subjective' sensations are factors in producing delusions. Thus a lunatic who has subjective smells may think his food is

poisoned. He imagines the smell to be in the food itself. So far or chronic cases. The temporary subjective sensations* which usher in an attack of epilepsy probably give a turn to the temporary mental disorder at the onset of and after the paroxysm. One of Dr. Jackson's patients had fits *beginning in his thumb*, and used, as he became unconscious, to cry out that his thumb was coming off and that blood spurted out of it. The presumption is that he had an 'aura' of red vision. After the fit, but before he was fully himself, he saw blood all over his clothes. Another patient who had an aura of colour next 'saw faces,' and then went off into convulsions. The probability is that such subjective sensations, which are projected externally, develop or give a turn to dream-like states preceding complete loss of consciousness, or to the delirium or mania sometimes following the paroxysm. To make this clearer let us state the usually accepted theory of dreams. It is believed that they are developed by some external irritation, as for example, a noise, or by some peripheral irritation, as for example a sore throat or a cramp in the finger. Taking the last illustration; the cramp develops a dream that a cat is biting the dreamer's finger. Similarly when a patient after an epileptic fit is in a condition which is the pathological analogue of the condition in sleep, the development of the colour red in the seizure is probably the cause of dreadful dreams of blood, flames, &c. (Vide infra quotation from Falret.)

"Colour sensations are far commoner than sensations referred to the other senses, that is to say, the most special sense is the one most often affected. And of colour, as stated, 'red' is the one most often developed. Dr. Hughlings Jackson finds that Falret has remarked on the frequency of red vision in epileptic maniacs. He says 'they constantly see luminous objects, flames, circles of fire, *and what is worthy of remark the colour red or the sight of blood frequently predominates in their visions.*'"

* The colour developed is practically external, because although the physical change is in the *central* nervous system, the colour is "referred to the environment," or perhaps it is better to say is "projected externally." Starting from a physical change in the central nervous system developing a sensation which is only referred externally, we pass next to *peripheral* physical states, which give rise to sensations referred externally. These, too, may be the causes of illusions. It is the opinion of Helmholtz that the illusions of rats, mice, and snakes, from which patients who have delirium tremens suffer, are developed by intra-ocular muscæ. In healthy people intra-ocular muscæ are referred to, or give rise to effects in, the environment; such "watery globules" as some people see, especially in the sunshine, and "black specks" before the eyes, would easily "turn into" snakes and mice in the exhausted brain of the drunkard. It is only a stage beyond this when things really external develop illusions, as, for example, when a person poisoned by belladonna mistakes a piece of fluff for a louse.